

**A Clinical Evaluation of Biocreative Therapy for  
En-Masse Retraction of the Maxillary Anterior  
Teeth**

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*To the soul of my father,  
To my mother,  
Your good examples have taught me to work hard for the things  
that I aspire to achieve*

*To my lovely husband,  
For being a constant source of support & encouragement.  
I'm truly thankful for having you in my life*

*To my daughter & best friend, Nour,  
To my little distracting son, Hassan,  
You've waited for dinner and waited for me.  
I can come to play now*

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## **List of Abbreviations**

CR	Centre of resistance
M/F	Moment-to-force ratio
FE	Finite element
PDL	Periodontal ligament
NiTi	Nickel Titanium
TMA	Titanium Molibdinum Alloy
SS	Stainless Steel
K-SIR	Kalra Simultaneous Intrusion and Retraction
TSR	Two-step retraction
TADs	Temporary anchorage devices
FEM	Finite element method
ARH	Anterior Retraction Hook
HOT	High Orthodontic Traction
LOT	Low Orthodontic Traction
MI	Mini-implant
CT	Computed Tomography
CBCT	Cone Beam Computed Tomography
TPA	Transpalatal arch
DJR	Double J Retractor
2D	Two-Dimensional
3D	Three-Dimensional
LARH	Lingual anterior retraction hook
CLR	C-lingual retractor
APLR	Antero-posterior lingual retractor
DICOM	Digital imaging and communications in medicine
OHRQoL	Oral health related quality of life
TSQ	Treatment satisfaction questionnaire
OHIP	Oral health impact profile
ANS	Anterior nasal spine
Ba	Basion
N	Nasion

## **List of Abbreviations (Continued)**

PNS	Posterior nasal spine
A	Point A
S	Sella tursica
Or	Orbitale
Po	Porion
Co	Columella
Ls	Labrale Superius
Li	Labrale inferius
Pn	Pronasale
N''	Soft tissue Nasion
Sn	Subnasale
Pog''	Soft tissue Pogonion
B''	Soft tissue Supramentale
Sts	Stomion Superius
Sti	Stomion Inferius
U1	Upper central incisor
U2	Upper lateral incisor
U3	Upper canine
U6	Upper first molar
FHP	Frankfurt horizontal plane
MSP	Mid-sagittal plane
N perp	Nasion perpendicular plane
PP	Palatal plane
S Ver	S Vertical plane
Max occ	Maxillary occlusal plane
Ant occ	Anterior occlusal plane
SNA	SNA
A to N perp	Point A to Nasion perpendicular plane
CR	Coronal retraction
RR	Root retraction
V	Vertical movement
BL-inc	Bucco-lingual Inclination

## **List of Abbreviations (Continued)**

MD	Mesio-distal angulation
ICW	Inter-canine width
IMW	Inter-molar width
Max occ/PP	Max occ plane/PP
Ant occ/PP	Ant occl plane/PP
Ls/E-line	Upper lip to E-line
Li/E-line	Lower lip to E-line
NLA	Nasolabial angle
ILG	Inter-labial gap
SD	Standard deviation
RDE	Relative Dahlberg Error
CCC	Concordance Correlation Coefficients
Diff	Difference
Freq	Frequency
Per	Percent



## **INTRODUCTION**

Dentoalveolar protrusion with resultant protrusive lips is commonly treated by premolar extraction followed by incisors retraction to obtain the desired dental and soft tissue profile changes. Correct positioning of the maxillary and mandibular incisors is essential for function, stability, and esthetics. Retraction of the anterior segment, therefore, represents a fundamental and often critical stage in orthodontic treatment.

Certain criteria should be fulfilled in the applied biomechanical system to achieve the desired tooth movement. The applied moment-to-force ratio on the six anterior teeth determines the type of tooth movement, such as uncontrolled tipping, controlled tipping, bodily movement, or root torque. The direction and the application point of retraction force in relation to the location of the centre of resistance (CR) are critical factors in predicting and planning the retraction of anterior teeth.<sup>(1)</sup>

In addition, maximum anchorage is commonly required in patients with severe protrusion. Variable anchorage loss has been reported with conventional retraction by sliding mechanics in extraction cases. Use of miniscrew for reinforcement of orthodontic anchorage has become increasingly popular in recent years, especially for space closure in maximum anchorage cases. Miniscrews are convenient, save time, and require minimal patient cooperation.

Sliding mechanics are the most commonly used mechanics for space closure with miniscrew anchorage. However, the sliding mechanic retraction assembly with direct anchorage from miniscrew reported biomechanical drawbacks. These biomechanical side effects may be in three planes and inherent with the use of continuous arch sliding mechanics with miniscrews. The force used during retraction is not reciprocal, posteriorly it is negated by the miniscrew and not the teeth. As a result, the entire arch rotates around the centre of resistance. These mechanics produce posterior open bite and anterior deep overbite.